AF/1762

Docket No.: M4065.0069/P069
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Garo J. Derderian

Application No.: 09/121,528

Filed: July 23, 1998

For: CONTINUOUS GOOD STEP COVERAGE CVD PLATINUM METAL DEPOSITION

Group Art Unit: 1762

Examiner: T. Meeks

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#25

5/31/01

TRANSMITTAL LETTER

Commissioner for Patents
Washington, DC 20231

Dear Sir:

Enclosed is an Appellant's Amended Brief on Appeal (32 Pages) for filing in connection with the above-referenced Patent Application.

The Commissioner is hereby authorized to charge any deficiency in the fees associated with this Amended Brief to our Deposit Account No. 04-1073, under Order No. M4065.0069/P069. A duplicate copy of this paper is enclosed.

Dated: May 29, 2001

Respectfully submitted,

By ________________

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PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Patent Application of: Derderian, Garo J.	)	
Serial No.: 09/121,528	)	Examiner: T. Meeks
Filed: July 23, 1998	)	Group Art Unit: 1762
For: CONTINUOUS GOOD STEP COVERAGE CVD PLATINUM METAL DEPOSITION	)	

Assistant Commissioner for Patents
Washington, D.C. 20231

APPELLANT'S AMENDED BRIEF ON APPEAL

Sir:

This is an Amended Brief for an appeal pursuant to 35 U.S.C. § 134 and 37 C.F.R. §§ 1.191 et seq. from the final rejection of claims 1-4, 6-10, 12-36 and 46-68 of the above-identified application mailed August 18, 2000. Any deficiency in the fees associated with this Amended Brief should be charged to our Deposit Account No. 04-1073. The Notice of Appeal was filed on February 14, 2001, the Appeal Brief was filed on April 16, 2001 and the Notification of Non-Compliance with 37 C.F.R. § 1.192(c) was mailed on May 11, 2001. Enclosed are an original and two copies of this Amended Brief with appended claims.

I. Real Party in Interest

The real party in interest in this appeal is Micron Technology, Inc., a Corporation of the State of Delaware, the assignee of this application.

II. Related Appeals and Interferences

There are no appeals or interferences known to Appellant, his legal representative, or the assignee that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. Status of Claims

Claims 56-58 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Baum et al. (U.S. Patent No. 5,783,716).

Claims 61-68 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Baum et al. (U.S. Patent No. 5,783,716) in view of Kwon et al.

Claims 1-4, 6-10, 12-36 and 46-55 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Baum et al. (U.S. Patent No. 5,783,716) in view of Kwon et al. and Chen et al.

Claims 1-4, 6-10, 12-36 and 46-68 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon et al. in view of Baum et al. (U.S. Patent No. 5,783,716) and Chen et al.

IV. Status of Amendments

There have been no amendments subsequent to the August 18, 2000 Office Action.

V. Summary of Invention

The present invention relates to a method for depositing a platinum based metal film by CVD deposition. A non-reactive gas is bubbled over an organic platinum based metal precursor until the non-reactive gas is saturated with the precursor. (Specification at 8; lines 5-28). The platinum based metal film is then deposited onto a substrate in a CVD deposition chamber in the presence of both oxygen and nitrous oxide at a combined flow rate in the range of about 1500 sccm to about 2500 sccm. (Specification at 10, lines 5-9). The resulting film is consistently smooth and has good step coverage. (Specification at 11, lines 23-28; Figure 2). The present invention employs nitrous oxide (N_2O) and oxygen (O_2) flowing at a predetermined high rate during the CVD process to control the deposition rate and the step coverage of the platinum group metal. (Specification at 9, lines 16-25; at 10, lines 6-12).

The present invention further provides a method for depositing a platinum metal on a substrate which includes the steps of flowing a gas having saturated therein a platinum precursor over the substrate with a temperature of about 200 °C to about 300 °C in the presence of both oxygen (O_2) and nitrous oxide (N_2O). (Specification at 16, lines 1-35; at 17, lines 1-23). The selected operating temperature is a temperature at which the platinum group metal deposits on the substrate, but less than a temperature at which the platinum group metal fails to smoothly deposit on the substrate. (Specification at 5, liens 10-15). The time at which the process operates, of about 45 seconds to about 1000 seconds, is a

deposition time at which the platinum group metal will deposit on the substrate in a continuous film while maintaining good step coverage. (Specification at 11, lines 27-33; at 12, lines 1-11). Most importantly, because the combined flow rate of oxygen and nitrous oxide is very high, a smooth film with a good step coverage is unexpectedly obtained. (Specification at 17, lines 5-23; Figure 2).

VI. Issues

Whether the rejection of claims 56-58 under 35 U.S.C. § 103(a) as being unpatentable over Baum et al. (U.S. Patent No. 5,783,716) should be reversed.

Whether the rejection of claims 61-68 under 35 U.S.C. § 103(a) as being unpatentable over Baum et al. (U.S. Patent No. 5,783,716) in view of Kwon et al. should be reversed.

Whether the rejection of claims 1-4, 6-10, 12-36 and 46-55 under 35 U.S.C. § 103(a) as being unpatentable over Baum et al. (U.S. Patent No. 5,783,716) in view of Kwon et al. and Chen et al. should be reversed.

Whether the rejection of claims 1-4, 6-10, 12-36 and 46-68 under 35 U.S.C. § 103(a) as being unpatentable over Kwon et al. in view of Baum et al. (U.S. Patent No. 5,783,716) and Chen et al. should be reversed.

VII. Grouping of Claims

None of the claims in the appeal stand or fall together. The reasons why the Appellant believes the claims to be separately patentably are set forth in the Argument section of this Brief.

VIII. Argument

CLAIMS 56-68 ARE PATENTABLE OVER BAUM ET AL. (U.S. PATENT NO. 5,783,716)

Claims 56-68 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Baum et al. (U.S. Patent No. 5,783,716) ("Baum").

Independent claims 56, 61 and 66 relate to a method for depositing a platinum group metal on a substrate according to which the platinum group metal is deposited onto a substrate in a CVD deposition chamber in the presence of both oxygen and nitrous oxide at a predetermined ratio with "a combined flow rate in the range of about 1500 sccm to about 2500 sccm" and at "a predetermined temperature of from about 200°C to about 300°C." Dependent claims 57, 62 as well as independent claim 66 further recite that the predetermined deposition time is "of about 45 seconds to about 1000 seconds." Dependent claims 58, 63 and 68 further limit the deposition time to "about 75 seconds to about 150 seconds." These parameters are not disclosed or suggested by Baum et al. ("Baum").

Baum relates to a liquid delivery for the transport of a platinum source reagent to a CVD reactor using a source reagent liquid solution which is volatilized to provide a vapor phase platinum source material for subsequent deposition from the vapor in the CVD reactor of platinum. Baum recites that the liquid solution precursor may optionally comprise an oxidizing gas such as oxygen, ozone, nitrous oxide and mixtures thereof in a platinum CVD deposition process. (Col. 5, lines 13-27). Baum is silent as to the operating conditions of the liquid delivery apparatus to be used in a CVD process other than to recite that the liquid delivery eliminates "the deleterious effects of having oxygen in contact with capacitor oxides at high temperatures (i.e., ≥500°C)." (Col. 5, lines 1-3).

1. Baum does not teach or suggest the subject matter of claims 56-68

Baum does not teach or suggest the formation of a platinum film in the presence of both oxygen and nitrous oxide at a predetermined ratio with "a combined flow rate in the range of about 1500 sccm to about 2500 sccm" and at "a predetermined temperature of from about 200°C to about 300°C," as independent claims 56, 61 and 66 recite. Baum does not teach or suggest a predetermined deposition time "of about 45 seconds to about 1000 seconds," as independent claim 66 and dependent claims 57, 62 further recite, or of "about 75 seconds to about 150 seconds," as dependent claims 58, 63 and 68 recite.

Baum provides virtually no guidance as how to conduct the process, leaving everything undisclosed. Baum is completely silent as to the total flow rate at which both oxygen and nitrous oxide are introduced into the chamber. Baum is also silent as to the deposition time or to the film thicknesses. Baum is further silent as to Pt film qualities, such as smoothness and uniformity, and most importantly, good step coverage, which the Appellant seeks to obtain. Baum does not even disclose platinum based film by CVD deposition using a non-reactive gas which is bubbled over an organic platinum based metal precursor. Baum uses instead direct liquid delivery for volatilizing a source reagent liquid solution. (Col. 3, lines 24-65). The only teaching of Baum is the use of an oxidizing gas such as oxygen, ozone, nitrous oxide and mixtures thereof in a platinum CVD deposition process, (Col. 5, lines 13-27), to achieve "faster film growth rates." (Col. 4, line 67).

2. The total flow rate of oxidizing gases in Baum is not a result effective parameter

To overcome the lack of deposition parameters in Baum, the final Office Action stated that "the flow rate of oxidizing gases to the chamber is a result effective parameter and it would have been a matter of routine experimentation to determine appropriate . . .

flow rates." (August 18, 2000 Office Action at 3). The final Office Action then asserted that, although "Baum et al. are silent as to the deposition times and Pt film thicknesses . . . these parameters are clearly related and the thickness is a function of the intended purpose." (August 18, 2000 Office Action at 2). This unsupported assertion of "routine experimentation" evidences nothing more than a lack of teaching or suggestion in Baum.

This assertion, that the total flow rate of oxidizing gases, is a result effective parameter is an unsupported assumption. For the reasons below, determining the total flow rate of oxygen and nitrous oxide as recited by claims 56, 61 and 66 is not a matter of routine experimentation and the total flow rate of oxygen and nitrous oxide as recited by claims 56, 61 and 66 is not a result effective parameter. Similarly, determining the total flow rate of oxygen and nitrous oxide for metal deposition under a predetermined time of "about 45 seconds to about 1500 seconds," as independent claim 66 and dependent claims 57 and 62 recite, or of "about 75 seconds to about 150 seconds," as dependent claims 58, 63 and 68 recite, is not matter of routine experimentation.

Courts have generally recognized the rule that the discovery of an optimum value of a variable in a known process is typically obvious. See e.g., In re Aller, 42 C.C.P.A. 824, 220 F.2d 454, 105 U.S.P.Q. 233 (1955). However, courts have found exceptions to this rule in cases where the results of optimizing a variable, which was known to be result effective, were unexpectedly good. For example, in In re Waymouth, 499 F.2d 1273, 1276, 182 U.S.P.Q. 290, 293 (CCPA 1974), the Court of Appeals held that unexpected results for a claimed range as compared with the range disclosed in the prior art had been shown by a demonstration of "a marked improvement, over the results achieved under other ratios." Evidence of unobvious or unexpected advantageous properties, such as superiority in a property the claimed compound shares with the prior art can rebut prima facie obviousness. In re Chupp, 816 F.2d 643, 646, 2 U.S.P.Q.2d 1437, 1439 (Fed. Cir. 1987). Accordingly, a specific ratio of halogen to mercury for producing whiter light by a

lamp was held by the Court to be "critical" for attainment of maximum white light emission, and the claimed ratio was not the result of obvious experimentation. In re Waymouth, 499 F.2d at 1276.

Exceptions to the above-identified rule have been also found by courts in cases where the parameter optimized was not recognized to be a result-effective parameter. See e.g., In re Antoine, 559 F.2d 618, 195 U.S.P.Q. (BNA) 6 (1977). In In re Antoine, for example, the U.S. Court of Customs and Patent Appeals rejected the PTO's argument that "it would always be obvious for one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system even if there is no evidence in the record that the prior art recognized that particular parameter affected the result." Id. at 620. In its analysis, the Court reemphasized that "obvious to try is not the standard of 35 U.S.C. 103." Id. The Court concluded that "[D]isregard of the unobviousness of the results of the 'obvious to try' experiments disregards the 'invention as a whole' concept of § 103, In re Dien, 54 C.C.P.A. 1027, 371 F.2d 886, 152 USPQ 550 (1967) and In re Wiggins, 55 C.C.P.A. 1356, 397 F.2d 356, 158 U.S.P.Q. 199 (1968), and overemphasizes on the routine nature of the data gathering required to arrive at appellant's discovery, after its existence became expected, overlooks the last sentence in § 103." Id.

Determining the flow rate of oxygen and nitrous oxide in platinum deposition processes is not a matter of routine experimentation because optimization of the value of such flow rate is not recognized by those skilled in the art as being a result-effective parameter. In deposition processes of the semiconductor industry, increasing the flow rate of one oxidizing gas decreases at one point the step coverage mainly because the precursor gas becomes diluted. For example, during the deposition of titanium nitride (TiN), a flow carrier gas, such as helium (He), is flown in a bubbler over tetrakisdimethyl amido-titanium (TD mat) gas precursor. At the beginning of the deposition process, as the flow rate of the

carrier gas increases, the deposition rate of TiN and its step coverage increase accordingly. However, at some point during the deposition process, too much carrier gas adversely affects the deposition rate of TiN and the step coverage because the TD mat precursor gas becomes diluted.

Similarly, when argon (Ar) and oxygen (O_2) come into contact with a metal containing gas, such as a platinum containing gas for platinum deposition, there is always a danger of increasing the flow rates of argon and oxygen to the point where the metal containing gas becomes diluted.

Even if optimization of the combined flow rate of oxygen and nitrous oxide would be recognized by those skilled in the art as a result-effective parameter, under the holding of In re Waymouth, the combined flow rate of oxygen and nitrous oxide would not have been obvious as the results are unexpectedly good. In the present invention, the total flow rate of oxygen and nitrous oxide is extremely high compared to the flow rates of the prior art. As illustrated in Examples 1-4 of the Application, this combined flow rate, in a range of about 1500 sccm to about 2500 sccm, results in a continuous and smooth platinum film. More importantly, the smooth and continuous platinum film has unexpected good coverage, up to 69%, "a marked improvement" over the results achieved under the prior art. (Application at 17). As explained above, these results are unexpected because increasing the flow rate of carrier gases typically results in the dilution of the precursor gas and thus in poor step coverage and poor film qualities. Accordingly, the claimed total ratio of the present invention is not a mere result of routine or obvious experimentation, as recognized by the Courts in In re Waymouth and In re Antoine.

<u>CLAIMS 61-68 ARE PATENTABLE OVER BAUM ET AL. (U.S. PATENT NO. 5,783,716) IN VIEW OF KWON ET AL.</u>

Claims 61-68 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Baum et al. (U.S. Patent No. 5,783,716) ("Baum") in view of Kwon at al. ("Kwon").

As noted above, Baum relates to a liquid delivery for the transport of a platinum source reagent to a CVD reactor using a source reagent liquid solution which is volatilized to provide a vapor phase platinum source material for subsequent deposition from the vapor in the CVD reactor of platinum. Baum discloses that the liquid solution precursor may optionally comprise an oxidizing gas such as oxygen, ozone, nitrous oxide and mixtures thereof in a platinum CVD deposition process. (Col. 5, lines 13-27). Baum is silent, however, as to the operating conditions of the liquid delivery apparatus to be used in a CVD process.

Kwon addresses the relationship between the formation of holes at grain platinum edges on one hand, and the deposition temperature, nucleation and growth rate, and oxygen flow rates on the other hand. Kwon does not address good step coverage of platinum films using a combination of oxygen and nitrous oxide at high total flow rate.

The final Office Action failed to establish a case of *prima facie* obviousness for the subject matter of claims 61-68. As noted in § 2142 of the Manual of Patent Examining Procedure ("MPEP"), three basic criteria must be met to establish a *prima facie* case of obviousness, one of them being the requirement for the prior art to teach or suggest <u>all</u> the claim limitations. <u>In re Royka</u>, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). This way, "all words in a claim must be considered in judging the patentability of that claim against the prior art." <u>In re Wilson</u>, 4242 F.2d 1382, 1385, 165 U.S.P.Q. 494, 496 (CCPA 1970).

The final Office Action failed to establish a *prima facie* case of obviousness because not all claim limitations are taught or suggested by the combined teachings of Baum and Kwon. For example, Kwon does not disclose or suggest that the platinum deposition be conducted in the presence of oxygen and nitrous oxide as claims 61-68 recite. In addition, neither Kwon nor Baum teach or disclose "a total flow rate [of oxygen and nitrous oxide] in the range of about 1500 sccm to about 2500 sccm," as independent claims 61 and 66 recite. Furthermore, neither Kwon nor Baum teach or disclose a predetermined deposition time of "about 45 seconds to about 1000 seconds" (claims 62 and 66) or of "about 75 seconds to about 150 seconds" (claims 63 and 68) for platinum deposition conducted with oxygen and nitrous oxide at a total flow rate "in the range of about 1500 sccm to about 2500 sccm" (claims 61 and 66). Kwon discloses only that 20 sccm argon are mixed with 50 sccm oxygen. Kwon is silent, however, about any mixture of oxygen and nitrous oxide, or about any total flow rate of oxygen and nitrous oxide, much less about a predetermined deposition time for a total flow rate of oxygen and nitrous oxide in the range of about 1500 sccm to about 2500 sccm. Baum is also silent about any deposition times or any predetermined deposition times, much less about the predetermined deposition times of claims 62, 63, 66 and 68.

Neither Kwon nor Baum teach or disclose a predetermined temperature "in the range of 250 °C to 300 °C" (claims 64 and 67) or "in the range of 200 °C to 300 °C" (claim 66) for platinum deposition conducted with oxygen and nitrous oxide at a total flow rate "in the range of about 1500 sccm to about 2500 sccm" (claims 61 and 66). Kwon refers only to deposition temperatures within the range of 300 °C to 450 °C and Baum only mentions that the substrate temperature is "between 500° and 700°C in the presence of an O_2/NO_2 mixture." (Col. 9, lines 26-28). Once again, no case of *prima facie* obviousness has been established for the subject matter of claims 61-68.

Further, as noted above, Kwon does not address good step coverage of platinum films using a combination of oxygen and nitrous oxide at high total flow rate. Kwon addresses only the relationship between the formation of holes at grain platinum edges on one hand, and the deposition temperature, nucleation and growth rate, and oxygen flow rates on the other hand. If anything, Kwon proves that platinum film qualities are not a result of routine experimentation[1] and that platinum deposition parameters, such as deposition temperatures and time, are not "clearly related to the thickness" of such platinum films, as the final Office Action unfairly continues to assert.

Thus, the combined teachings of Baum and Kwon also fail to disclose or suggest that the CVD deposition method be performed with oxygen and nitrous oxide at a total flow rate "in the range of about 1500 sccm to about 2500 sccm" (claims 61 and 66) and at a predetermined deposition time of "about 45 seconds to about 1000 seconds" (claims 62 and 66) or of "about 75 seconds to about 150 seconds" (claims 63 and 68), or at a predetermined temperature "in the range of 250 °C to 300 °C" (claims 64 and 67) or "in the range of 200 °C to 300 °C" (claim 66). There is nothing in this combination of references, without the improper use of hindsight reconstruction, to motivate the person having ordinary skill in the art to arrive at the instantly claimed method.

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[1] Kwon addresses ways of improving specific qualities of platinum based films formed by various CVD methods, but does not address achieving good step coverage for platinum films. (See Kwon, at 2850-2851, which, for example, analyses the hole formation at temperatures of about 450°C in contrast with hole formation at about 350°C).

CLAIMS 1-4, 6-10, 12-36, AND 46-55 ARE PATENTABLE OVER BAUM ET AL. (U.S. PATENT NO. 5,783,716) IN VIEW OF KWON ET AL. AND CHEN ET AL.

Claims 1-4, 6-10, 12-36, and 46-55 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Baum et al. (U.S. Patent No. 5,783,716) ("Baum") in view of Kwon at al. ("Kwon") and Chen et al. ("Chen").

The final Office Action conceded that Baum does not disclose a pressure. Nevertheless, to overcome the shortcoming of Baum, the final Office Action relied upon Kwon, which teaches a pressure of 2 Torr in the CVD deposition of platinum, and upon Chen, which teaches platinum deposition at 760 Torr (atmospheric pressure). In this respect, the final Office Action concluded that "it would have been obvious to have used deposition pressures in this range (2 Torr to atmospheric (760 Torr)) which overlaps with the claimed ranges because these deposition pressures would have been expected to be effective for depositing the platinum films by CVD with these precursors." (August 18, 2000 Office Action at 6-7).

1. The references do not teach or suggest the subject matter of claims 1-4, 6-10, 12-36 and 46-55

The claimed invention is not obvious over Baum in view of Kwon and Chen. First, Baum is silent as to the operating pressure of the CVD apparatus. Second, even if Kwon recites a deposition pressure of 2 Torr, Kwon does not disclose or suggest that the platinum deposition be conducted in the presence of oxygen and nitrous oxide as presently claimed. Thus, even if Kwon might suggest a platinum deposition at a pressure within the claimed range, Kwon still does not suggest the claimed chemistry, which is the mixture of oxygen and nitrous oxide at a very high flow rate, of about 1500 sccm to about 2500 sccm,

or that the pressure used in Kwon would be applicable to the claimed chemistry or flow rate. Third, Kwon does not teach or disclose a pressure other than 2 Torr. There is nothing to indicate that Kwon's 2 Torr pressure or any greater pressure would be appropriate for a deposition chemistry which includes oxygen and nitrous oxide and at the recited flow rates. Fourth, even if Kwon and Chen could have been modified and combined, "the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art suggests the desirability of the combination." (MPEP, § 2143.1 citing In re Mills, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990). Nothing in Baum, Chen or Kwon suggests the desirability of applying a pressure other than 2 Torr or 760 Torr to a deposition chemistry which includes oxygen and nitrous oxide.

Similarly, Chen recites a deposition pressure of 760 Torr, but does not disclose or even suggest that the platinum deposition be effectuated in the presence of oxygen and nitrous oxide. Chen is also silent about the total flow rate in the range of about 1500 sccm to about 2500 sccm, as independent claims 1, 6 and 25 recite. In fact, Chen teaches a completely different mixture, that is flowing argon and hydrogen over a hot substrate. Further, Chen does not teach or disclose a pressure other than the atmospheric pressure and, again, Chen does not suggest that his pressure could be used with the specifically claimed chemistry. Thus, although Kwon and Chen arguably teach platinum deposition at very specific pressures, it is clear that Kwon and Chen do not teach or suggest that such pressures or any other pressure would be at all useful with the claimed chemistry and flow rates.

Furthermore, Kwon and Chen disclose entirely different chemistries from that employed in Baum. The Office Action disagrees with the Applicant's statement that the references are simply not combinable in view of the diverse chemistries involved in each reference, noting that "[I]n all three processes, there is decomposition of the same

precursor to deposit a platinum film." (Office Action at 11). But this statement is not true. Baum discloses platinum deposition by using a variety of solid precursors, such as tetrakis (trifluorophosphine) paltinum, bis (β-diketonate) platinum, (cyclopentadienyl) platinum trimethyl, among others. (Col. 1, lines 42-46). Chen specifically notes that studies were done by decomposition of $C\textit{p}PtMe_3$ prepared by $PtMe_3I$ and $NaC\textit{p}$ but using toluene instead of benzene as solvent. Finally, Kwon discloses only deposition by metallorganic chemical vapor deposition using only (methylcyclopentadienyl) trimethylplatinum ($MeC\textit{p}PtMe_3$).

In addition and for all reasons described above, Baum in view of Kwon and Chen does not suggest or disclose the formation of a platinum film in the presence of both oxygen and nitrous oxide at a predetermined ratio with "a combined flow rate in the range of about 1500 sccm to about 2500 sccm" (claims 1, 6 and 25) and at "a predetermined temperature of from about 200°C to about 600°C," as dependent claims 4 and 10 and independent claim 25 recite, or of "about 275°C," as dependent claim 30 further recites. Baum only mentions that the substrate temperature is "between 500° and 700°C in the presence of an O_2/NO_2 mixture," Kwon refers only to deposition temperatures within the range of 300 °C to 450 °C and (Col. 9, lines 26-28) and Chen teaches flowing argon and hydrogen vaporized at 25 °C. Thus, Baum in view of Kwon and Chen fails to suggest or disclose the temperature range of each of claims 4, 10, 25 and 30.

Baum in view of Kwon and Chen also does not suggest or disclose the formation of a platinum film in the presence of both oxygen and nitrous oxide at a predetermined ratio with "a combined flow rate in the range of about 1500 sccm to about 2500 sccm" (claims 1, 6 and 25) and at a predetermined deposition time of "about 75 seconds to about 150 seconds" (claim 23), or at a pressure of "about 10 to about 50 Torr" (claims 46, 48 and 52) or of "about 15 to about 30 Torr" (claim 47, 49 and 53). All three references are silent about any deposition time, much less about a predetermined deposition time of

about 75 seconds to about 150 seconds. In addition, Kwon teaches only a pressure of 2 Torr, Chen teaches a pressure of 760 Torr and Baum is silent about any deposition pressure. Accordingly, the combined references fail to suggest or disclose the deposition pressure limitations of dependent claims 23, 46-49, 52 and 53.

Further and also for the reasons described above, Baum in view of Kwon and Chen also fails to suggest or disclose the formation of a platinum film in the presence of both oxygen and nitrous oxide at a predetermined ratio with "a combined flow rate in the range of about 1500 sccm to about 2500 sccm" (claims 1, 6 and 25) on a substrate "selected from the group consisting of silicon, TiN, Ti, oxides, Si_3N_2, and silicide" (claim 20 and 27), or on a substrate "selected from the group consisting of borophosphosilicate glass and silicon" (claims 21 and 28), or on an oxide substrate "selected from the group consisting of borophosphosilicates and phosphosilicates" (claims 50 and 54). Although it is true that Baum refers to other substrates comprising, for example, "a perovskite oxide" or a diffusion barrier material such as "titanium nitride, tantalum nitride, and titanium aluminum" (Col. 7, lines 59-64), and although Chen refers to a SiO_2(100nm)/Si substrate and Kwon refers to either glass slides or silicon wafers, none of them suggests or discloses platinum deposition on such substrates in the presence of both oxygen and nitrous oxide at a very high predetermined ratio. It is clear, therefore, that the rejection is based on picking and choosing selected portions of each reference, without regard to the totality of teachings of the references, in an attempt to improperly use hindsight to reconstruct the invention. Accordingly, a person of ordinary skill in the art would not have been motivated to combine Baum with Kwon and Chen, and withdrawal of this rejection is respectfully requested.

2. The references do not teach or suggest a range of deposition pressures

Kwon does not suggest or disclose a deposition pressure other than a low pressure such as 2 Torr. Kwon's pressure of 2 Torr is outside the claimed range of 10 Torr to 1000 Torr of the Appellant's invention. Further, Kwon does not disclose or suggest the limitations of the claimed invention. Kwon addresses the dependency between the microstructure and electrical properties of platinum films on one hand, and the various deposition conditions, such as temperature, on the other hand. Kwon analyses the impact of only two deposition parameters (temperature and oxygen flow rates) on the nucleation and growth rates of platinum films. For example, according to Kwon, at a 50 sccm oxygen flow rate, "[P]latinum films deposited at 300 and 350°C showed a random orientation, but above 400°C the preferred orientation was (111)." (Kwon at 3). With respect to pressure, Kwon mentions only once that "the Pt source was vaporized at reduced pressure (2 Torr). (Kwon at 1). Kwon is silent on the impact, if any, that different pressures would have on the Pt film properties. More important, Kwon is silent on whether any variation in the deposition pressure could have any effect on the nucleation and growth rates of the Pt film. Thus, Kwon does not disclose or even suggest in any way a range of deposition pressures for which Kwon's experimental data would be valid. Moreover, by showing widely diverging deposition results with minor temperature variations, Kwon further demonstrates the weakness of the Office Action's assumption that the recited high flow rates for the claimed invention, which are <u>not</u> taught in <u>any</u> reference, are merely the result of routine experimentation.

Similarly, Chen does not disclose or suggest a deposition pressure other than 760 Torr (atmospheric pressure). Even if Chen's atmospheric pressure falls within the claimed range of 10 Torr to 1000 Torr, Chen fails to teach or suggest other aspects of the claimed invention. For example, Chen teaches chemistries different from those taught by the Appellant. In analyzing the impact of low temperatures on an atmosphere of hydrogen

on the deposition of polycrystalline films of platinum, Chen uses toluene instead of benzene as the solvent, with the reaction starting at - 77°C and the substrate being held at 180°C. Chen mentions that "[T]he complex was vaporized at atmospheric pressure and 25°C into a stream of flowing argon." Atmospheric pressure and a temperature of 25-27°C are standard conditions, however, and Chen does not suggest any range of pressure, and certainly not a lower than 760 Torr pressure that would work with low temperature and toluene, and not the conventional benzene as solvent. Chen is silent on any range of very low pressures, such as a range including a pressure of 2 Torr, and certainly discloses no pressure range for the claimed chemistry.

Moreover, in the last Office Action, the Examiner tried to create a pressure range of 2 Torr to 760 Torr based on the pressures of Kwon and Chen. However, because each reference uses a different chemistry,[2] it is illogical and improper to define a wide pressure range based on two respective pressure points, one from each reference, much less the claimed pressure range. Accordingly, Kwon and Chen together do not suggest any range for the deposition pressure, and certainly not the claimed range of 10 Torr to 1000 Torr.

Thus, for the reasons above, Baum in view of Kwon and Chen does not teach or suggest the CVD deposition in the presence of oxygen and nitrous oxide "at a pressure of from about 10 to about 1000 Torr" (claims 1, 6 and 25) or of "about 30 Torr" (claim 31). Baum in view of Kwon and Chen also does not teach or suggest the CVD deposition in the presence of oxygen and nitrous at a predetermined ratio with "a combined flow rate in the range of about 1500 sccm to about 2500 sccm" (claims 1, 6 and 25) and at a pressure of "about 10 to about 50 Torr" (claims 46, 48 and 52) or of "about 15 to about 30 Torr"

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[2] Kwon teaches platinum deposition in the presence of oxygen, in addition to argon or hydrogen introduced into the reactor chamber. Chen teaches platinum deposition in an atmosphere of hydrogen and a stream of flowing argon.

(claim 47, 49 and 53). Accordingly, claims 1-4, 6-10, 12-36 and 46-55 are patentable over Baum in view of Kwon and Chen.

CLAIMS 1-4, 6-10, 12-36 AND 46-55 ARE PATENTABLE OVER KWON ET AL. IN VIEW OF BAUM ET AL. (U.S. PATENT NO. 5,783,716) AND CHEN ET AL.

Claims 1-4, 6-10, 12-36, and 46-55 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Kwon at al. ("Kwon") in view of Baum et al. (U.S. Patent No. 5,783,716) ("Baum") and Chen et al. ("Chen").

Kwon teaches a pressure of 2 Torr in the CVD deposition of platinum by bubbling argon over a platinum precursor. As conceded by the final Office Action, Kwon does not disclose or suggest that the platinum deposition be conducted in the presence of oxygen and nitrous oxide at a total flow rate in the range of about 1500 sccm to about 2500 sccm as presently claimed. Furthermore, Kwon does not teach or disclose a pressure other than 2 Torr. Nevertheless, to overcome this shortcoming in Kwon, the final Office Action relies upon Baum to teach a mixture of oxidizing agents which may include oxygen and nitrous oxide. However, Baum does not suggest in any way how to modify Kwon, because, inter alia, Baum is completely silent on the deposition pressure and uses a different chemistry.

The Office Action also relies on Chen to teach a platinum deposition at atmospheric pressure (760 Torr). But, Chen is not concerned with any variation in the deposition pressure and his chemistry is different from those of Baum and Kwon. As explained above, Chen merely lists the 760 Torr pressure, along with the room temperature of 25°C, as standard operating parameters. There is nothing in Chen to even suggest that a low pressure may, or could, work with toluene as solvent under a very low temperature of

-77°C. Thus, Baum and Chen do not disclose or suggest how to modify Kwon to attain the claimed invention.

More importantly, there is no motivation to combine the teachings of Baum with those of Chen. Baum does not recite the use of reducing gases such as hydrogen (H_2) during the deposition process, while Chen specifically teaches the deposition of "impurity-free . . . platinum metal . . . in an atmosphere of hydrogen." In fact, Baum teaches away from using a reducing gas, noting that "applicants have determined that the presence of reactivity of hydrogen . . . in the CVD formation of conducting platinum electrodes . . . can actually be detrimental." (Col. 4, lines 59-64). Accordingly, Kwon in view of Baum and Chen does not disclose or suggest the formation of a platinum film in the presence of both oxygen and nitrous oxide at a predetermined ratio with "a combined flow rate in the range of about 1500 sccm to about 2500 sccm" (claims 1, 6 and 25) and at "a predetermined temperature of from about 200°C to about 600°C," as dependent claims 4 and 10 and independent claim 25 recite, or of "about 275°C," as dependent claim 30 recites. Kwon in view of Baum and Chen also does not suggest or disclose the formation of a platinum film in the presence of both oxygen and nitrous oxide at a predetermined ratio with "a combined flow rate in the range of about 1500 sccm to about 2500 sccm" (claims 1, 6 and 25) and at a predetermined deposition time of "about 75 seconds to about 150 seconds" (claim 23), or at a pressure of "about 10 to about 50 Torr" (claims 46, 48 and 52) or of "about 15 to about 30 Torr" (claim 47, 49 and 53). All three references are silent about any deposition time, much less about a predetermined deposition time of about 75 seconds to about 150 seconds. In addition, Kwon teaches only a pressure of 2 Torr, Chen teaches only a pressure of 760 Torr, Baum is silent about any deposition pressure and the references fail to teach or suggest a range of deposition pressures, much less the ranges of deposition pressures of claims 46-49, 52 and 53.

Further and also for the reasons described above, Kwon in view of Baum and Chen also fails to suggest or disclose the formation of a platinum film in the presence of both oxygen and nitrous oxide at a predetermined ratio with "a combined flow rate in the range of about 1500 sccm to about 2500 sccm" (claims 1, 6 and 25) on a substrate "selected from the group consisting of silicon, TiN, Ti, oxides, Si_3N_2, and silicide" (claim 20 and 27), or on a substrate "selected from the group consisting of borophosphosilicate glass and silicon" (claims 21 and 28), or on an oxide substrate "selected from the group consisting of borophosphosilicates and phosphosilicates" (claims 50 and 54). Although it is true that Kwon refers to either glass slides or silicon wafers, and although Baum refers to other substrates comprising, for example, "a perovskite oxide" or a diffusion barrier material such as "titanium nitride, tantalum nitride, and titanium aluminum" (Col. 7, lines 59-64) and Chen refers to a SiO_2(100nm)/Si substrate, the references do not suggest or disclose platinum deposition on the above-mentioned substrates in the presence of both oxygen and nitrous oxide and at a very high predetermined ratio. It is clear, therefore, that the rejection is based on picking and choosing selected portions of each reference, without regard to the totality of teachings of the references, in an attempt to improperly use hindsight to reconstruct the invention.

IX. Conclusion

In Conclusion, Appellants respectfully submit that the Final Rejection of claims 1-4, 6-10, 12-36 and 46-68 is in error for at least the reasons given above and it should be reversed.

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Respectfully submitted,

By

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